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AUTHOR Stenvall, John Theodore; Stenvall, Marilyn J.
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ABSTRACT

Research was conducted to assess interpretation, implications, and significance of the 2000 Advanced Placement Index (API) scores for California public schools. Multiple regression models were developed from the statistics on each type of school at the elementary, middle, and high school levels using traditional, double-session, year-round single, three-, four-, and five-track calendars. Results show that schools on balanced calendars (single track) outperformed gains recorded for traditional calendar schools at all levels. Multitrack year-round schools on three-track and five-track calendars improved their APIs in year 2000 over year 1999. Four-track calendar schools gained over the year, but did not score higher gains than traditional calendar schools owing to the impact of limited-English-proficient (LEP) and socioeconomically (SES) disadvantaged students. Impaction is a significant factor that requires further study. Further research is also indicated in terms of programs, both curricular and parent-oriented, that would further ameliorate the effect of SES, LEP, and lunch programs. Three appendices containing data and calculations for peer review are available upon request. (RT)

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An Analysis of 2000 API Scores for California Public Schools on Traditional and Year-Round Calendars at the Elementary, Middle and High School Levels

By

John Theodore Stenvall, Ph.D.

and

Marilyn J. Stenvall, Executive Director

National Association for Year-Round Education

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THE AUTHORS

John T. Stenvall holds B.S.I.E., M.S. degrees from the Illinois Institute of Technology and a Ph.D from Arizona State University. He has designed and implemented education systems for I.B.M. and was national manager for direct access education system for General Electric's Information Systems Division. He has taught and consulted with universities and businesses on four continents.

Marilyn J. Stenvall is Executive Director, National Association for Year-Round Education. She is a former high school principal, district office director, teacher, author and lecturer. She initiated year-round education in California's largest secondary school district.

NATIONAL ASSOCIATION FOR YEAR-ROUND EDUCATION
Post Office Box 711386, San Diego, California 92110
Phone 619.276.5296, Fax 858.571.5754, www.nayre.org

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RESEARCH FINDINGS

In order to adequately compare achievement between schools on year-round calendars and those on traditional calendars in the State of California, it was necessary to use a standard measure of achievement applied to all schools in the state. With the advent of the 1999 Academic Performance Index, all students in California, numbering over four million, are tested on the Stanford 9, a standardized basic skills test, given in the spring in grades 2 through 11. The California schools, numbering more than 7,000, receive a score from 200 to 1000, with 800 set as the target goal. In addition, the school rankings are compared with those of schools with similar demographics in a separate score. In order to reach the target score of 1000, all students in a single school would have to score 80% correct answers on the test; the governor's goal is that each school should improve its score by 5% yearly.

The focus of the cross sectional research is to assess the interpretation, implications and significance of the 1999 Advanced Placement Index (API) scores for California public schools. Multiple regression models were developed from the statistics on each type school, elementary, middle and high school, using traditional, double session and year-round single, three, four and five track calendars. The validated multiple regression models may be used by educators in predicting whether academic performance meets the attainable API for elementary, middle and high schools in districts. Correlations between independent and dependent variables associated with each model, establish the independent variables that are suggestive of the type of educational programs that need to be initiated for improving APIs.

The research focused on three questions: First, do APIs differ for students attending public schools on year-round calendars as compared to those on traditional calendars; second, what independent variables in a multiple regression model are useful in predicting APIs; and third, how may the multiple regression model be used by school districts.

In analyzing the API scores there were several variables that were significant in influencing scores: they were the number of students enrolled at the school, the number of limited English proficient students, the number of low SES ranked students, and the number on free and reduced lunches. Other factors and data collected were not useful predictors.

The results showed that in comparing schools at the elementary, middle and high school levels in 1999, the first year of testing, those schools on year-round calendars did not score as high as those on traditional calendars. However, the first year of a longitudinal study, 2000, showed that there was greater progress in schools with certain year-round calendars than in those on traditional calendars.

Schools on balanced calendars (single track) outperformed gains recorded for traditional calendar schools at all levels. Multi-track year-round schools on three-track and five-track calendars improved their APIs significantly in year 2000 over year 1999. Four-track calendar schools gained significantly over the year but did not score higher gains than traditional calendar schools; however there was a significant impact of students in LEP and SES areas in these 4-track schools, by comparison with traditional calendar schools.

Although initially it may appear that schools on a 4-track plan are not progressing at the same rate as traditional calendar schools or schools on other year-round calendars, the fact of impaction is a significant one that requires further study. For example, schools on a four-track calendar number 15% of the elementary schools, but account for over 20% of the school population. An investigation of intersession programs directed to needs of the school population (i.e. LEP, SES) should be undertaken to better evaluate the use of instructional time offered in the intersession periods.

The research evidence did not find whether a specific public school calendar significantly improved student achievement. With the availability of cross sectional API data for 1999 and 2000, longitudinal studies can be initiated to investigate and to assess the difference calendars make on schools reaching their target APIs.

Further study is indicated in terms of programs, both curricular and parent-oriented, that would further ameliorate the effects of SES, LEP and lunch programs.

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INTRODUCTION

The focus of the research is to assess the interpretation, implications and significance of the 2000 Advanced Placement Index scores for California public schools. This is a longitudinal assessment of the 2000 Advanced Placement Index (API) scores for California public schools. Multiple regression models were developed from the statistics on each type school at the elementary, middle and high school levels using traditional, double session and year-round single, three, four and five track calendars.

The validated multiple regression models may be used by educators in predicting whether academic performance meets the attainable API for elementary, middle and high schools in districts. Correlations between independent and dependent variables associated with each model, establish the independent variables that are suggestive of the type of educational programs that need to be initiated for improving APIs. The availability of cross sectional API data for 1999 and 2000 enabled a longitudinal study to investigate and to assess the difference calendars made on schools reaching their target APIs. The research evidence found that specific public school calendars, particularly year-round calendars, significantly improved student achievement.

BACKGROUND FOR THE RESEARCH

The 1994 California Public Schools Accountability Act (PSSA) requires the California Department of Education (CDE) to annually calculate, rank and publish an "Academic Performance Index (API)," for each public school in California. The year 1999 was established as the base year. Each school is expected to show a minimum performance gain of 5% annually from its 1999 base API. There are four minor exceptions to the required 5% growth rate. API scores range from 200 to 800, with about 10% of all schools at the 800 level. The CDE posted the 1999 and 2000 APIs on its Internet web site (http://www.cde.ca.gov/psaa/api/fallapi/api9900data.htm). Each California public school in the file has its data contained on one line. Data for a total of 157 schools was lacking and data fields 87 to 92 were incomplete in many of the reporting schools, making the data unusable for analysis. Methodology for calculating each school's API is available on the CDE web site.

METHODOLOGY FOR THE STUDY

The methodology seeks to find answers to three questions. First, do APIs differ for students attending public schools on a year round calendar (YRE) when compared to their peers in a traditional calendar school (TCS)? Second, what independent variables in a multiple regression model are useful in predicting APIs? Finally, how may the multiple regression model be used by school districts?

CDE's amassed API empirical data was analyzed descriptively to find variables useful for establishing a regression model for inferentially calculating APIs in California public schools at the elementary, middle and high school levels. Longitudinally, 1999 APIs were useful in the elementary and high school regression analysis but discarded for bias in the middle school regression model. Standard deviation values for each variable provided the dispersion from each mean. Using the mean, standard deviation, number of cohorts and the appropriate z or t statistic, confidence intervals were established on the probability ranges for each variable used in resolving the regression models. Regression equations for predicting API values were made by statistically grouping schools by traditional and year-round calendars. F and t tests were used to uncover bias in the statistical regression analysis. Factor analysis reduced the large mass of data to measures that provided high Power and Reliability Index Values to validate the correlation between variables. Correlation analysis between independent and dependent variables indicated strong relationships for predicting the likelihood of effects on API performance.

API data was downloaded for each public school and selected fields (F) taken from each record. Fields (F) abstracted for this analysis are designated in appendix 1 by CDE field number positions, to wit, fields 4, 5, 7, 8, 16, 30, 37, 44, 51, 58, 65, 79, 80, 82, 93 & 98. An index of field descriptions can be found on CDE's web site. From this data, the statistical summaries were prepared to enable the regression analysis. Key data descriptions are as follows:

- The dependent variable is the average API score per school, by calendar type, of students taking the API 9 test from which the APIs were calculated. Column data (j = 1 to 4) represent the independent variable observed and the

rows (m = 0 to 6) are the number of observations where Y(i) is the dependent average API per type calendar school for all tested students. The (i) numbers 0 to 5 indicate the type calendar that schools use in meeting the requirement that students receive 1,080 hours of classroom learning by operating the equivalent of a 6 hours a day for 180 days.

- The total number of students in each school was calculated by dividing the number of pupils tested (F11) by the percent of pupils tested (F10). All three fields were used in the analysis. The mean and standard deviation for the number of students (total and tested) by E, M and H calendar type schools (0,2,1,3,4 and 5) was calculated.
- CDE's code designated only two types of schools: traditional calendar schools (TCS) and multitrack year-round calendar schools (MTYR). The two designations were inadequate for analysis and each school was re-designated to reflect TCS (0), TCS - double session (2), YR - single track (1), YR - three tracks (3), YR - four tracks (4) and YR - five tracks (5). The source for the re-designations were the publications Twenty-sixth Reference Directory of Year-round Education Programs for the 1999-2000 School Year and School by School Listing of Year-Round Education Programs for the 1999-2000 School Year, both compiled and edited by the NAYRE Staff and published by the National Association for Year-Round Education, P.O. Box 711386, San Diego, CA 92171-1386, 619.276.5296, Fax 858.571.5754, e-mail - walsh@nayre.org and web page - www.nayre.org.
- The average API by calendar type schools (0,2,1,3,4 and 5) was calculated by multiplying the number of students tested by the API score for each school, summing the results and dividing by the total number of students in each of the by E, M and H calendar type schools (0,2,1,3,4 and 5).
- Pupil ethnicity was aggregated into the major groupings of white, Hispanic, African American, American Indian, Asian, Filipino and Pacific Islanders.
- The percentage of students who are Limited English Proficient (LEP). The number of pupils who are socioeconomically disadvantaged (SES), receiving free or moderately priced lunches and the mobility or the percent of pupils attending each school for the first time in the current year. The statistical means and standard deviations for each category were calculated by E, M and H schools by calendar type (0,2,1,3,4 and 5).
- Data indicating the parent's education level was incomplete and unreliable for statistical analysis. Similarly, the percent of teachers with full or emergency credentials was unusable since it could not be converted to the number of students per teacher.

INCONSEQUENTIAL DATA ITEMS

The initial multiple regression models used ten (10) independent variables to find predictors of the dependent API variable. Independent variables that are not significant in formulating an acceptable regression equation include the number of students tested per calendar type school, the percentage of students entering transferring into another school, the percentage of teachers fully credentialled and the number of students by ethnicity. Values for the ethnicity of students tested proved highly biased in regression analysis. The impact of ethnicity on determining APIs is not relevant to any of the regression models tested and may be highly discriminatory. If ethnicity is used to set state or local school education policies regarding raising API performance, it goes counter to the regression model which found ethnicity not a factor in determining APIs. Similarly, the values for mobility for pupils, parent education levels and the percent of teachers fully credentialled distorted the multiple regression models tested for determining APIs. In assessing various regression models for middle schools, the 1999 APIs did not contribute to a reliable model; when the number of students tested replace the 1999 APIs acceptable parameters were found.

IMPROVING DATA COLLECTION

In the evolutionary process developing a workable kit of tools for predicting APIs, The California Department of Education needs to change its data collection and analysis methods. Additional independent variables not in the CDE data that need to be gathered for testing to determine their contribution to APIs include the following nine items:

1. Designation of each school by traditional (0 & 2) and year-round (1, 3,4 & 5) calendars.
2. Number of students taking APIs (#API).
3. Average class size (CS) or pupils per teacher (PPT).
4. Dollars spent per pupil taking API examinations (AVG$).
5. Average number of students attending school over the full testing period (#AR).
6. Number of students graduating from 8th and 12th grades (#G8) or (#G12).

7. Number of students enrolled in advanced placement classes (#AP).
8. Total of property and physical crimes committed per school (#CRIME).
9. Total discipline cases consisting of dropouts, expulsions and suspensions (#DES).
10. Extra session hours per student, such as intersessions or summer school, outside of regularly scheduled calendar class hours (ESH).

DEFINING YRE AND TCS CALENDARS

YRE and TCS calendars both provided the equivalent of 180 days of instruction a year. Traditional school calendars operate for nine months from September to June with a 3 month summer vacation that may contribute to significant learning loss by the students. School is in session approximately 6 hours a day for 180 days. There are no intersessions to reduce failure rates by at risk students. Summer school may be an option offered to some students.

Double track calendars are TCS schools and not year-round calendars. A double track calendar divides the student population into two groups. The first group attends school from 7 a.m. to 12 noon and the second group attends school from 1 p.m. to 6 p.m. To meet the six hour-180 day standard, the school must operate 216 days to meet the 1,080 hour class time requirement. Research is needed to determine whether double track schools are effective or ineffective in producing excellence in learning when used to solve overcrowding.

The year-round calendar rescheduling provides opportunities for intersessions throughout the school year. that allow time for remediation and enrichment throughout the school year. Intersessions are the periods of time rescheduled from summer vacation and redistributed within the school year. They are used as vacation and instructional time for remediation and enrichment with both single and multitrack calendars. Intersessions typically involve school staff and community resources to provide a safety net and an academic boost to avoid failure or enhance achievement.

SINGLE TRACK YEAR-ROUND CALENDARS

Typical year-round calendars have these characteristics. Single-track year-round education provides a balanced calendar for a more continuous period of instruction. Students and all school personnel follow the same instructional and vacation schedule. Single-track does not reduce class size, nor does it allow a school to accommodate more students.

1. Single track balanced/modified calendars are usually 45/10, 45/15, 60/20/or 90/30 calendars which can provide a varying number of instructional days. Summer vacation is divided throughout a school year with staff and students at school at the same time. Intersessions may be offered during the break times.
2. Extended school year calendars are lengthened from the current 170-180 instructional days up to 240 instructional days. (Approximately 245 possible days remain after Saturdays, Sundays, federal and state holidays are subtracted from the 365-day calendar.)
3. Flexible all-year calendars are where the school's instructional schedule is approximately 240 days per year and students are required to attend the minimum number of days designated by each state. Education is individualized; students and staff vacation throughout the year in short breaks.

MULTI-TRACK YEAR-ROUND CALENDARS

Multi-track year-round education is used primarily to alleviate ` overcrowding, although it also incorporates the educational values of single-track year-round education, including intersessions. It was designed specifically for schools with a shortage of classroom space. Multi-track avoids double sessions and the extended school day. It also alleviates the need to build costly new buildings with their attendant operating costs. Multi-track divides students and teachers into groups, or tracks of approximately the same size. Each track is assigned its own schedule. Teachers and students assigned to a particular track follow the same schedule and are in school and on vacation at the same time. Example: implementing a four-track year-round calendar extends the capacity of a school by 33%. A school with the capacity of 750 students can accommodate 1,000 students, as only three tracks of 250 would be in school at the same time; there would always be one track on vacation or intersession every day of the school year.

SUMMARY OF SCHOOL FACILITIES AND STUDENT POPULATIONS

YRE schools are 20.3% of all school facilities but represent 21.9% of the students; the YRE elementary school facilities are 25% of all elementary schools with 32.6% of the students. YRE middle school facilities are 11% of all middle schools and enroll 15% of the pupils. YRE high school facilities are 6% of all high schools with 9.9% of all students.

Figure 1. Summary of the Number of Public Schools and Pupils in the State of California - 2000

Track	Total Schools	% Elem.	% Middle	% High	% All Sch.	Total # Pupils	% Elem.	% Middle	% High	% All Pupils
0	5,301	53.4%	14.7%	11.6%	79.7%	3,245,653	33.1%	20.5%	24.5%	78.1%
2	3	0.0%	0.0%	0.0%	0.0%	2,442	0.0%	0.0%	0.0%	0.0%
1	353	4.3%	0.7%	0.3%	5.3%	185,154	2.8%	1.0%	0.7%	4.5%
3	215	2.6%	0.3%	0.3%	3.2%	235,095	3.1%	1.1%	1.5%	5.7%
4	772	10.8%	0.8%	0.1%	11.6%	480,516	10.0%	1.4%	0.1%	11.6%
5	10	0.1%	0.0%	0.0%	0.2%	6,092	0.1%	0.0%	0.0%	0.1%
Sums	6,654	71.2%	16.5%	12.3%	100.0%	4,154,952	49.1%	24.0%	26.8%	100.0%

THE REGRESSION EQUATION FOR ELEMENTARY SCHOOLS

The significant regression variables establishing the regression equation for determining the API score for any calendar elementary school is as follows:

API = 602.413 - 0.176*PUPILS/SCHOOL - 0.041*%LEP - 0.925*%SES + 0.641*%LUNCH + 0.286*1999API

All the regression models (elementary, middle & high school) may be used to determine if the district is on target in reaching its attainable APIs. To find the API test score per type calendar schools (0,1,3,4,5) enter the designated independent variables, such as in elementary schools the average number of students per school, the number of students categorized as SES, receiving a free lunch and the number of students tested and the percentage of LEP pupils. The estimated API for the school can then be compared with the actual 2000 API attained.

The years (Y) to reach the predicted API for a district's elementary, middle and high schools are equal to the natural log (ln) of the predicted regression's API by the actual schools API, or $Y = \ln(API_{regression}/API_{actual})/0.05$. For example, assume a school district regression API indicates its API should be 540 when their actual API is 496. The years to reach their target is equal to the ln(540/496)/.05, giving 2 years for the district to reach its goal of 540. The estimated 2000 API for the school can then be compared with the actual 2000 API attained. After attaining the achievable standard in the time frames, a 5% annual increase in API scores will be very difficult without major intervention and remediation programs.

Figure 2. Elementary School Data by School Calendar (Track)

Track	# Schools	% Sch.	# Pupils	% Pupils	2000 APIs	#per Sch.	% LEP	# SES	# Free Lunch	1999 APIs
0	3,551	75.0%	1,378,856	67.4%	691	388	22	160	185	654
2	1	0.0%	676	0.0%	512	676	33	509	568	477
1	283	6.0%	114,979	5.6%	659	406	26	199	226	588
3	174	3.7%	128,645	6.3%	501	739	58	563	657	456
4	718	15.2%	416,528	20.4%	599	580	35	333	383	568
5	9	0.2%	5,290	0.3%	670	588	27	246	353	606
Sums	4,736	100.1%	2,044,974	100.0%	658	431	25	204	235	620

The explained variance (r^2) was 1 and the unexplained variance ($1-r^2$) was $-4.423*10^{-13}$. The (F) and (t) tests showed that Type II errors equaled zero, concluding H_o or that the API estimates are unbiased. A reliability index value (RIV) of -0.074 was found that is less than 0.1, and therefore acceptable. The higher the value of the sine (Power), the greater is the power of the information in the resolving vector in factor analysis; the Power found was 0.734. The observed independent variables are highly correlated to each other and the dependent API variable as shown in the following table. A school district may use the correlation matrix to assess the most economical use of resources to increase APIs.

Figure 3. Matrix of Correlations between Independent and Dependent Variables

Regression Variable	0	1	2	3	4
Students / school (0)	1.000				
Percent LEP pupils (1)	0.801	1.000			
Number SES pupils (2)	0.928	0.845	1.000		
Number lunch pupils (3)	0.971	0.855	0.987	1.000	
1999 API score (4)	-0.870	-0.824	-0.976	-0.953	1.000
2000 API score	-0.858	-0.746	-0.967	-0.932	0.932

The average or mean for all elementary school variables are API = 658, percent LEP = 27, number SES = 223 and number free lunch = 258. In looking a column A, YRE schools improved their 2000 APIs significantly over their 1999 APIs and except for track 4, outdistanced the gain by traditional calendar schools. However, column B displays that YRE school 2000 APIs are significantly lower than traditional schools but column C shows that YRE schools, except for calendar 4, made significant API gains between 1999 and 2000. The reason YRE APIs are lower than traditional calendar schools can be seen by comparing columns D with E, YRE schools had fewer facilities (column D) but carried more students (column E) than traditional schools. In term of LEP, SES and free lunch loads (columns F, G & H), YRE school API performance is exceptional compared to the loads borne by traditional schools.

Figure 4. Comparisons of Data Between YRE Calendars (1,3,4, 5) and Traditional Calendars (0, 2)

	Calendar	0	2	1	3	4	5
A	APIs 2000 Divided by APIs 1999	5.7%	7.3%	12.1%	9.9%	5.5%	10.6%
B	(2000 APIs divided by 2000 Traditional API)-1	0.0%	-25.9%	-4.6%	-27.5%	-13.3%	-3.0%
C	(1999 APIs divided by 1999 APIs in a Traditional School)-1	0.0%	-27.1%	-10.1%	-30.3%	-13.1%	-7.3%
D	Number of Schools divided by Traditional Schools	75.0%	0.0%	6.0%	3.7%	1.5%	0.2%
E	Number of Pupils divided by Traditional Schools	67.4%	0.0%	5.6%	6.3%	20.4%	0.3%
F	(Pupils divided by Pupils in a Traditional School)-1	0.0%	74.2%	4.6%	90.5%	49.5%	51.5%
G	(LEP Pupils divided by LEP Pupils - Traditional School)-1	0.0%	50.0%	18.2%	163.6%	59.1%	22.7%
H	(SES Pupils divided by SES Pupils - Traditional School)-1	0.0%	218.1%	24.4%	251.9%	108.1%	53.8%
I	(Lunch Pupils divided by Lunch Pupils - Traditional School)-1	0.0%	207.0%	22.2%	255.1%	107.0%	90.8%

Do school's APIs differ for students attending public schools on a year round calendar (YRE) when compared to their peers in a traditional calendar school (TCS)?

In the base year, 1999, the answer was "No." The 2000 API data allowed a longitudinal analysis that showed that YRE calendars make a positive difference in raising API scores compared to traditional calendar schools. In looking at the APIs by school calendar, the novice in investigation might perceive that year-round calendar schools did not perform as well as traditional calendar schools. Due diligence in looking at the data suggests otherwise. Since all elementary schools on year-round calendars, except for track 5, had APIs below the traditional calendar schools, the explanation of the difference lies in the high LEP and SES amounts with which year-round schools had to cope. The negative impact of SES appears to be ameliorated by the schools free lunch program. Dividing the LEP, SES, free lunch and 1999 API means of all schools by the traditional calendar school's values and subtracting one provides a zero amount for traditional calendars and the percentage increase or decrease that YRE calendars have over traditional calendars.

THE REGRESSION EQUATION FOR MIDDLE SCHOOLS

The significant regression variables establishing the regression equation for determining the API score for any calendar elementary school are as follows:

API = 747.176 - 5.504*PUPILS/SCHOOL - 6.842*%LEP - 0.624*#SES + 0.498*#LUNCH + 5.636*#PUPILSTESTED

Figure 5. Middle School Data by School Calendar (Track)

Track	# Schools	% Sch.	# Pupils	% Pupils	2000 APIs	#per Sch.	% LEP	# SES	# Free Lunch	# Tested	1999 APIs
0	980	88.9%	852,496	85.1%	658	870	18	330	377	859	637
2	2	0.2%	1,766	0.2%	604	883	30	486	569	877	623
1	48	4.4%	42,561	4.3%	591	887	26	441	521	873	565
3	21	1.9%	45,176	4.5%	485	2,151	35	1570	1,661	2,124	453
4	50	4.5%	58,467	5.8%	587	1,173	29	555	1,158	1,158	568
5	1	0.1%	802	0.1%	554	802	28	521	794	794	566
Sums	1,102	100.0%	1,001,268	100.0%	643	1,823	20	404	487	922	614

The explained variance (r^2) was 1 and the unexplained variance ($1-r^2$) was $-5.201*10^{-11}$. The (F) and (t) tests showed that Type II errors equaled zero, concluding H_0 or that the API estimates are unbiased. A reliability index value (RIV) of -0.089 was found that is less than 0.1, and therefore acceptable. The higher the value of the sine (Power), the greater is the power of the information in the resolving vector in factor analysis; the Power found was 0.625. The observed independent variables are highly correlated to each other and the dependent API variable as shown in the following table. A school district may use the correlation matrix to assess the most economical use of resources to increase APIs.

Figure 6. Matrix of Correlations between Independent and Dependent Variables

Regression Variable	0	1	2	3	4
Students / school (0)	1.000				
Percent LEP pupils (1)	0.674	1.000			
Number SES pupils (2)	0.974	0.751	1.000		
Number lunch pupils (3)	0.980	0.758	0.998	1.000	
1999 API score (4)	1.000	0.675	0.974	0.980	1.000
2000 API score	0.798	0.613	0.769	0.760	0.798

Independent variables that are not significant in formulating an acceptable regression equation include the number of students tested per calendar type school, the percentage of students entering transferring into another school, the percentage of teachers fully credentialled, the number of students by ethnicity and 1999 APIs. Values for the ethnicity of students tested proved highly biased in regression analysis. The impact of ethnicity on determining APIs is not relevant to any of the regression models tested and may be highly discriminatory. If ethnicity is used to set state or local school education policies regarding raising API performance, it goes counter to the regression model which found ethnicity not a factor in determining APIs. Similarly, the values for mobility for pupils, parent education levels and the percent of teachers fully credentialled distorted the multiple regression models tested for determining APIs.

The average or mean for all middle school variables are API = 643, percent LEP = 20, number SES = 404 and number free lunch = 487. In looking a column A, YRE schools improved their 2000 APIs significantly over their 1999 APIs and except for track 4, outdistanced the gain by traditional calendar schools. However, column B displays that YRE school 2000 APIs are significantly lower than traditional schools but column C shows that YRE schools, except for calendar 4, made significant API gains between 1999 and 2000.

Statistical findings indicate one reason YRE APIs are lower than traditional calendar schools can be seen by comparing columns D with E, YRE schools had fewer facilities (column D) but carried more students (column E) than traditional schools. In term of LEP, SES and free lunch loads (columns F, G & H), YRE school API performance is exceptional compared to the loads borne by traditional schools.

Figure 7. Comparisons of Data Between YRE Calendars (1,3,4, 5) and Traditional Calendars (0, 2)

	Calendar	0	2	1	3	4	5
A	APIs 2000 divided by APIs 1999	3.3%	-3.0%	4.6%	7.1%	3.3%	-2.1%
B	(2000 APIs divided by 2000 Traditional API)-1	0.0%	-8.2%	-10.2%	-26.3%	-10.8%	-15.8%
C	(1999 APIs divided by 1999 APIs in a Traditional School)-1	0.0%	-2.2%	-11.3%	-28.9%	-10.8%	-11.1%
D	Number of Schools divided by Traditional Schools	88.9%	0.2%	4.4%	1.9%	4.5%	0.1%
E	Number of Pupils divided by Traditional Schools	85.1%	0.2%	4.3%	4.5%	5.8%	0.1%
F	(Pupils divided by Pupils in a Traditional School)-1	0.0%	1.5%	2.0%	147.2%	34.8%	-7.8%
G	(LEP Pupils divided by LEP Pupils - Traditional School)-1	0.0%	66.7%	44.4%	94.4%	61.1%	55.6%
H	(SES Pupils divided by SES Pupils - Traditional School)-1	0.0%	47.3%	33.6%	375.8%	68.2%	57.9%
I	(Lunch Pupils divided by Lunch Pupils - Traditional School)-1	0.0%	-2.2%	-11.3%	-28.9%	-10.8%	-11.1%

THE REGRESSION EQUATION FOR HIGH SCHOOLS

The significant regression variables establishing the regression equation for determining the API score for any calendar high school is as follows:

$$API = 898.387 - 0.373*PUPILS/SCHOOL + 0.129*(\#SES+\%LEP+\#LUNCH) + 0.214*1999API$$

To find the API test score per type calendar schools (0,1,3,4 and 5) enter the average number of students per school, the sum of the number of students categorized as percent LEP, number SES and number receiving a free lunch, and then the 1999 API. The estimated API for the school can then be compared with the actual 2000 API attained.

Figure 8. High School Data by School Calendar (Track)

Track	# Schools	% Sch.	# Pupils	% Pupils	2000 APIs	#per Sch.	# SES	% LEP	# Free Lunch	# Tested	1999 APIs
0	769	94.4%	1,016,301	91.5%	637	1,322	352	14	392	1,275	626
1	22	2.7%	27,613	2.5%	636	1,255	298	10	295	1,224	598
3	20	2.5%	61,278	5.5%	477	3,064	2278	34	2,504	2,873	466
4	4	0.4%	5,521	0.5%	611	1,380	355	11	416	1,310	591
Sums	815	100.0%	1,110,713	100.0%	628	1,363	457	15	554	1,267	582

The explained variance (r^2) was 1 and the unexplained variance ($1-r^2$) was $3.107*10^{-12}$. The observed F was greater than the table (F) concluding H_1. The (t) tests showed that Type II errors equaled zero, concluding H_0 or that the API estimates are unbiased. A reliability index value (RIV) of -0.014 was found that is less than 0.1, and therefore acceptable. The higher the value of the sine (Power), the greater is the power of the information in the resolving vector in factor analysis; the Power found was 0.833. The observed independent variables are highly correlated to each other and the dependent API variable as shown in the following table. A school district may use the correlation matrix to assess the most economical use of resources to increase APIs.

Figure 9. Matrix of Correlations between Independent and Dependent Variables

Regression Variable	0	1	3
Students / school (0)	1.000		
SUM SES+LEP+LUNCH (1)	1.000	1.000	
1999 API score (3)	-0.977	-0.975	1.000
2000 API dependent var.	0.891	0.898	-0.897

The average or mean for all high school variables are API = 628, percent LEP = 15, number SES = 457 and number free lunch = 554. In looking a column A, YRE schools improved their 2000 APIs significantly over their 1999 APIs and except for track 4, outdistanced the gain by traditional calendar schools. However, column B displays that YRE school 2000 APIs are significantly lower than traditional schools but column C shows that YRE schools, except for calendar 4, made significant API gains between 1999 and 2000. The reason YRE APIs are lower than traditional calendar schools can be seen by comparing columns D with E, YRE schools had fewer facilities (column D) but carried more students (column E) than traditional schools. In term of LEP, SES and free lunch loads (columns F, G & H), YRE school API performance is exceptional compared to the loads borne by traditional schools.

Figure 10. Comparisons of Data Between YRE Calendars (1,3,4, 5) and Traditional Calendars (0, 2)

=	Calendar	0	1	3	4
A	APIs 2000 Divided by APIs 1999	1.8%	6.4%	2.4%	3.4%
B	(2000 APIs divided by 2000 Traditional API)-1	0.0%	-0.2%	-25.1%	-4.1%
C	(1999 APIs divided by 1999 APIs in a Traditional School)-1	0.0%	-4.5%	-25.6%	-5.6%
D	Number of Schools divided by Traditional Schools	94.4%	2.7%	2.5%	0.4%
E	Number of Pupils divided by Traditional Schools	91.5%	2.5%	5.5%	0.5%
F	(Pupils divided by Pupils in a Traditional School)-1	0.0%	-5.1%	131.8%	4.4%
G	(LEP Pupils divided by LEP Pupils - Traditional School)-1	0.0%	-28.6%	142.9%	-21.4%
H	(SES Pupils divided by SES Pupils - Traditional School)-1	0.0%	-15.3%	547.2%	0.9%
I	(Lunch Pupils divided by Lunch Pupils - Traditional School)-1	0.0%	212.2%	632.9%	23.4%

AVAILABILITY OF DATA FOR PEER REVIEW

The text, the statistical calculations and regression modeling methodology are available on nine 3.5-1.44 megabyte floppy disks in Lotus WordPro (.lwp), Lotus spreadsheet (.123) and MathCad 6.0 (.mcd) formats. Three appendices are available upon request that contain data and calculations divided into the following three appendices:

Appendix 1

- Summary of Regression Evaluation of Elementary School 2000 APIs
- Ratio Impact Analysis of Elementary School APIs, LEP, SES & Free Lunch Data
- Statistical Summary of Data for Calendars 0, 2, 1, 3, 4 & 5

Appendix 2

- Summary of Regression Evaluation of Middle School 2000 APIs
- Ratio Impact Analysis of Middle School APIs, LEP, SES & Free Lunch Data
- Statistical Summary of Data for Calendars 0, 2, 1, 3, 4 & 5

Appendix 3

- Summary of Regression Evaluation of High School 2000 APIs
- Ratio Impact Analysis of High School APIs, LEP, SES & Free Lunch Data
- Statistical Summary of Data for Calendars 0, 2, 1, 3, 4 & 5

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